

WHAT IS CLAIMED IS:

1. A method for generating a nucleic acid, the method comprising:
 - a) providing a first immobilized nucleic acid comprising a first 5' region and a first 3' region;
 - b) providing a second immobilized nucleic acid comprising a second 5' region and a second 3' region, wherein said second 3' region and said first 5' region comprise identical nucleic acid sequences;
 - c) contacting said first immobilized nucleic acid with an oligonucleotide under conditions promoting hybridization of said oligonucleotide to said first 3' region and extension of said hybridized oligonucleotide to produce a first extension product comprising a first extension product 3' region that is complementary to said first 5' region; and
 - d) contacting said second immobilized nucleic acid with said first extension product under conditions promoting hybridization of said first extension product 3' region to said second 3' region and extension of said hybridized extension product 3' region to produce a second extension product comprising a second extension product 3' region that is complementary to said second 5' region, wherein said second extension product comprises said first and second 3' and 5' regions.
2. A method for generating a nucleic acid, the method comprising:
 - a) providing a plurality of nucleic acids immobilized on a surface; wherein said plurality of nucleic acids comprises nucleic acids having overlapping complementary sequences;
 - b) releasing said plurality of nucleic acids into solution; and
 - c) providing conditions promoting:
 - i) hybridization of said complementary sequences; and,
 - ii) extension or ligation of said hybridized nucleic acids to synthesize a longer nucleic acid.

3. A method for generating a nucleic acid comprising a predetermined sequence element, the method comprising:

- a) synthesizing a nucleic acid; and,
- b) introducing said synthesized nucleic acid into a system where said predetermined sequence element is required for replication, whereby replication of said nucleic acid is indicative of the presence of said predetermined sequence element.

4. A method for generating a nucleic acid molecule, the method comprising:

- a) providing a plurality of nucleic acids wherein said plurality comprises a first series of nucleic acids with redundant overlapping sequences and a second series of nucleic acids with redundant overlapping sequences, wherein nucleic acids from said first series are complementary to nucleic acids from said second series; and,
- b) providing conditions promoting:
 - i) hybridization of overlapping complementary nucleic acids; and,
 - ii) extension or ligation of said hybridized nucleic acids to synthesize a longer nucleic acid.

5. A method for positioning mobile components on a surface based on the affinity of an attached molecule for nucleic acids which have been positioned on that surface.

6. A method for monitoring the generation of a nucleic acid comprising:

- a) attaching a fluorescent group to the 5' terminus of an oligonucleotide;
- b) detecting the progress of the growing nucleotide chain through fluorescence microscopy.

7. A method for controlling the movement of a nucleic acid molecule by stepwise repositioning of the molecule.

8. A method for generating a nucleic acid molecule, the method comprising:

- a) providing a plurality of nucleic acids wherein said plurality comprises a first series of nucleic acids with redundant overlapping sequences and a second series of

nucleic acids with redundant overlapping sequences, wherein nucleic acids from said first series are complementary to nucleic acids from said second series; and,

- b) providing less stringent annealing conditions.

9. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising:

- a) providing a plurality or pool of nucleic acid molecules synthesized to have a user-specified sequence and length; and,
- b) separating error-containing nucleic acid molecules from nucleic acid molecules with error-free sequences using a component which actively selects for a sequence error.

10. The method of Claim 9 wherein said sequence error selecting component comprises mismatch recognition protein MutS or one of its functional homologs.

11. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising:

- a) providing a plurality or pool of nucleic acid molecules synthesized to have a user-specified sequence and length; and,
- b) selectively amplifying error-free nucleic acid molecules from said plurality or pool, thereby decreasing the relative amount of any nucleic acid molecules that contain errors.

12. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising:

- a) providing a plurality or pool of nucleic acid molecules synthesized to have a user-specified sequence and length; and
- b) correcting errors in said plurality or pool using nucleic acid molecules in said plurality or pool as a template for nucleic acid repair.

13. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising:

- a) providing a plurality or pool of nucleic acid molecules synthesized to have a user-specified sequence and length; and
- b) removing errors from portions of said nucleic acid molecules and recombining remaining portions of said nucleic acid molecules to yield nucleic acid molecules having an error-free sequence.